

Static Strength Development in Arm Wrestling for Students Attending Physical Education Lessons at a Technical University

Sergey V. Turlakov, Tatyana G. Turlakova, Marat Z. Akhmetzyanov*

M.T. Kalashnikov State Technical University, Izhevsk

Izhevsk, Russia

*g1badullinildus@yandex.ru**

Abstract: At the present stage, sport is characterized by a high level of sporting achievements and inexorably increasing competition. It prompts the search and development of new technologies in the system of training highly qualified athletes. **Materials.** The article shows ways to solve a number of problems related to the development of force by a static method with insurmountable resistance (isometry). Difficulties arise according to general pedagogical principles: activity, clarity of consciousness. These difficulties lie in the monotony of training, in the absence of determining the measure of measuring the creation of maximum effort in kilograms and the time of creating maximum effort during exercise. All this has a negative impact on the growth of athletic performance of armwrestlers- students. **Research methods.** Analysis and generalization of scientific literature, isometric method, methods of mathematical statistics. **Results.** The training process of arm wrestlers- students in static training using the isometric method (with insurmountable resistance) is clearly effective. **Conclusion.** The conducted pedagogical experiment confirmed the hypothesis about the possibility of setting an individual load and the possibility of taking control measurements in static force with insurmountable resistance in armwrestlers- students at specific points along the trajectory of movement.

Keywords: armwrestler - student training, static with insurmountable resistance, static with surmountable resistance, isometric method, analysis, effectiveness.

For citation: Sergey V. Turlakov, Tatyana G. Turlakova, Marat Z. Akhmetzyanov. Static Strength Development in Arm Wrestling for Students Attending Physical Education Lessons at a Technical University. *Russian Journal of Physical Education and Sport*. 2022; 17(1): 70-79. DOI: 10.14526/2070-4798-2022-17-1-86-97.

Introduction

At the present stage, sport is characterized by a high level of sporting achievements and inexorably increasing competition. It prompts the search and development of new technologies in the system of training qualified athletes.

The specifics of arm wrestling include a variety of loads, one of the loads is static efforts. Static is a fixed, fixed position of a body or its parts. Basically, the static used in arm wrestling is divided into static with surmountable resistance and with insurmountable resistance.

Static with surmountable resistance is the retention of weight in one position or, as a load, its own weight is used with a possible additional weight attached to the body. Static with insurmountable resistance is a weight, an object that cannot be moved. Researchers and trainers use the term isometric exercise, in both cases it is a form of exercise involving static muscle contraction without

any visible movement in the angle of the joint. The term "isometric" combines the Greek words isos (equal) and-metria (measuring). It means that in these exercises the length of the muscle and the angle of the joint do not change, although the strength of the contraction may vary. This is different from dynamic or isotonic contractions, in which the force of contraction does not change, although the length of the muscles and the angle of the joint change. This training option has proven itself well and is known for a long time, in Russia it was actively practiced by A.V. Zass in 1924. He created his own system. Then the system was picked up by the Americans, in particular, Dr. D. Ziegler of the late 50s, early 60s.

The isometric method is characterized by performing short-term maximum stresses without changing the length of the muscles. These exercises should be used as an additional means of developing strength. They are performed in the form of maximum stresses lasting 5-6 seconds, and in any

conditions, using stationary objects as inventory. It should be emphasized that the isometric method of force development has a number of undeniable advantages. So, if, when performing dynamic exercises, the maximum tension is achieved only in a separate, short moment of movement, then static exercises make it possible to maintain constant tension for a relatively long time, but specifically at one point with maximum effort. Therefore, the more such points there are throughout the trajectory of movement, the greater the force in dynamic movement will be. When forming such static points, it is necessary to strictly observe the trajectory of movement, otherwise, the force will be created outside the trajectory of movement. It may subsequently lead to incorrect formation of movement techniques [3,4,5,6,7,8,9,10,11].

Static exercises can affect almost any muscle group. They significantly develop strength and the ability to concentrate attention and are also a good tool for strengthening the bone and joint apparatus. The isometric method is extremely simple. It does not require complex and expensive equipment. Many forms of it are applicable in the simplest conditions, even at home, with the cost of training using static exercises for only 15-20 minutes without significant fatigue and without any negative effects on the specialization process. Statics with insurmountable resistance (isometry of English terminology) the method of force development passed a long and difficult path of its development and formation. Special studies have proven its high efficiency. Static exercises are successfully used in their training by representatives of various sports [6].

Pure static with insurmountable resistance (isometry) has, along with advantages, a number of disadvantages:

-the first biggest one is that you never know for sure whether you are working with maximum effort. It may seem to you that you are pulling or pressing one hundred percent, but in most cases, this is not the case. From the outside, it is impossible to determine whether you are applying 50,80 or 100% effort. Although the ability to make maximum tension in any movement comes with practice.

-the second drawback for many was its monotony, the lack of an emotional component,

unlike the dynamics, there is no emotional inspiration from the weight overcome.

-the third drawback was that it was impossible to express its results in numbers, unlike working on simulators or static with surmountable resistance. Here you cannot say for sure whether you are getting stronger or not. But on the other hand, if the results of one of your main exercises, movements increase after static, you can attribute this success to static efforts [2].

Research objective:

- the development of static strength among armwrestlers- students in athletic gymnastics classes using the isometric method.

Materials and methods

We conducted a pedagogical experiment involving second-year armwrestlers- students to determine static force with insurmountable resistance, using a device that fixes the effort to bend the arm in the elbow joint.

Men's and women's groups were formed. Men were divided into one control group, three groups were formed as experimental ones.

-the control group (KG) performed a training complex in the gym, according to general physical exercises using 6 exercises on simulators and with free weights (barbells, dumbbells, kettlebells). Students of all groups are divided into three, at least two people at each exercise, this division is connected with the rules of rest and insurance for the convenience and effectiveness of conducting training sessions. The exercises were performed by the approach method, changing exercises in a circle, during the lesson.

- the first experimental group (EG-1) performed the same, but one exercise was replaced by a static one with an insurmountable resistance, through which all the subjects passed.

- the second experimental group (EG-2) performed the same as the first, but the partners encouraged the subject, creating psychological support for him.

- the third experimental group (EG-3) performed the same as the first two, but the results were recorded by the device and the partners of the subject during the execution informed him of the

changing result displayed on the device display. It allowed the subject to determine what effort he was making, knowing the result of his initial testing.

The female groups were divided into a control group (KG) and two experimental groups (EG-1, EG-2) performed the same exercises, only unlike the male group, there was no second experimental group where the partners encouraged the subject, creating psychological support for him.

To select students, a dynamic test was taken in the experiment-pulling from the vise on a high crossbar for men and pulling from the vise lying on a low crossbar for women. The selection made it possible to form approximately equal groups of subjects on a strength basis.

In the experiment it was decided to include a pull-up from the vise on a high crossbar in men and a pull-up from the vise lying on a low crossbar in women as a control exercise to identify the relationship between the effect of static exercise on dynamic.

Physical education classes at Izhevsk Technological University are held twice a week. The duration of the training session is 1.5 hours. The static exercise was performed once a week. The experiment lasted 3 months, started at the end of September and ended at the end of December. In September the groups were engaged on the street, doing the work of the GPhT, educating speed qualities and endurance. In the second half of December they passed test standards, experimental and control exercises. In February, with the beginning of the new semester, testing was conducted to check the residual training effect of the experimental and control exercises.

Requirements for the experimental exercise: The student stood at the armwrestling table in the starting position of the armwrestler, additional conditions were introduced for the purity of the experiment.

I.P.- Legs shoulder-width apart, free hand behind the back, working hand on the pillow, back pressed against the wall. A strap was fixed on the forearm under the brush, the place of attachment of the forearm with the strap was located in the middle of the table, the brush in the maximum position. The other end of the strap was attached to the measuring

device, from the other part of the device there is a second strap, the free end of which was attached to the Swedish wall. The strap at the starting tension was in the horizontal plane. The angle at the elbow joint was 90 degrees. The body was pressed against the table. A standard arm -stand was used for the undersized-tables 10 cm high. At the command of the subjects, an effort was created by bending the arm in the elbow joint, the duration of the effort was 6 seconds, subjectively performed at 100% in EG-1 and EG-2. In the EG-3. The force was recorded by an electronic measuring device.

The time was recorded by a stopwatch. The readings of the device were recorded on the phone camera. Then the maximum effort and duration of holding the peak voltage were determined by video. The initial data was taken on the right and left hand. Before the test, a general dynamic and static warm-up was carried out in an experimental exercise. During the experiment, 4 working approaches were performed at 100% for each hand; three subjects started with the right hand, then with the left hand - the same. Rest was up to 90 seconds between the right and left hands and rest on the hands was up to 3 minutes.

Results and discussion

The results of the study on pulling up from hanging on the high crossbar (male groups): T1 test September, T2 test December, T3 test February.

Fig. 1 and Table 1 show that the highest increase in pulling up from hanging on a high crossbar was in the experimental group 3. The effect of using an electronic measuring device is visible.

There was no such increase in experimental groups 1 and 2. The result of the increase is approximately the same as in the control group.

The results of the study on the experimental isometric exercise, the strength index in kilograms right hand men's groups: T1 test September, T2 test December, T3 test February.

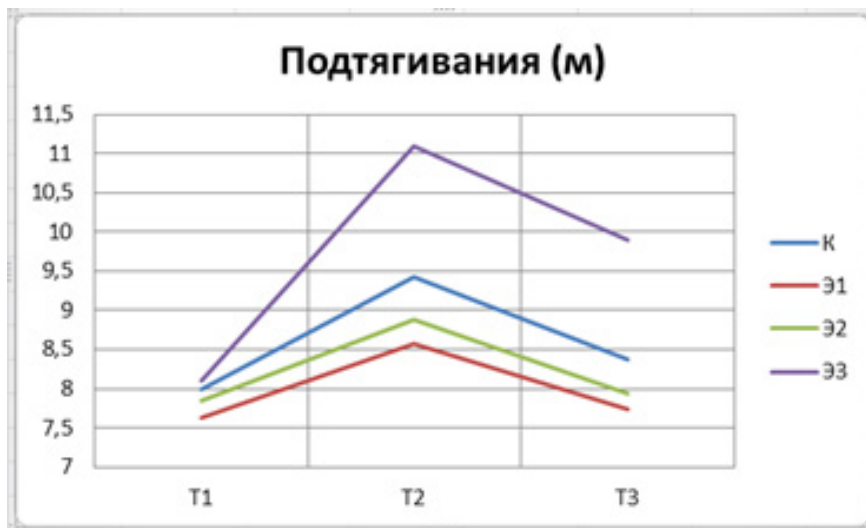


Fig.1

Table 1

	T1	T2	T3
К	8,0	9,4	8,3
Э1	7,6	8,5	7,7
Э2	7,8	8,8	7,9
Э3	8,1	11,1	9,9

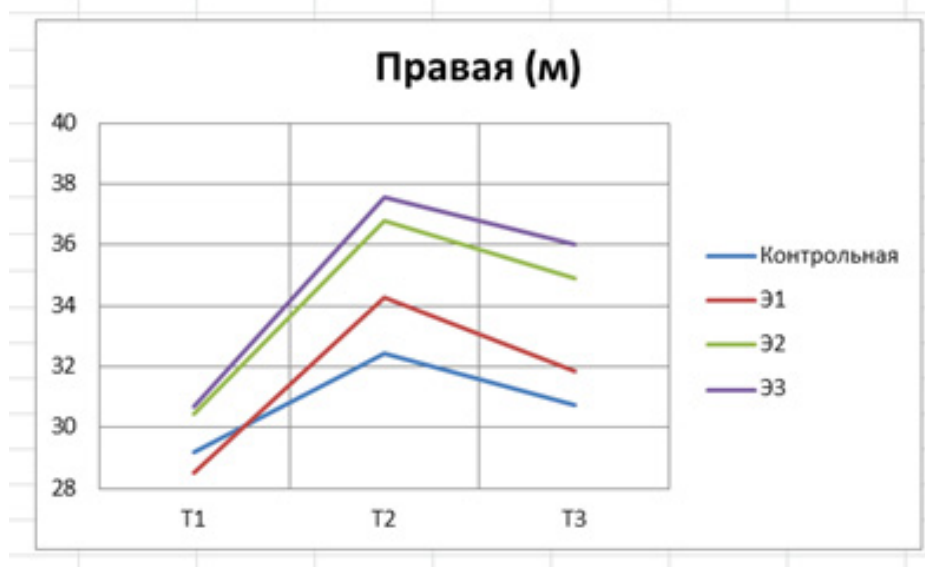


Fig.2

Table 2

	T1	T2	T3
К	29,2	32,4	30,7
Э1	28,5	34,2	31,8
Э2	30,4	36,8	34,9
Э3	30,7	37,6	36,0

Fig. 2 and Table 2 for the strength exercise on the right hand show that the highest increase in static strength was in the experimental group 3. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In the experimental groups 1 and 2 the indicators are also higher than in the control group.

There was an increase in the control group, but due to the development of strength in dynamic exercises.

The results of the study on an experimental

isometric exercise, strength index in kilograms, left arm, men's groups: T1 test - September, T2 test - December, T3 test - February.

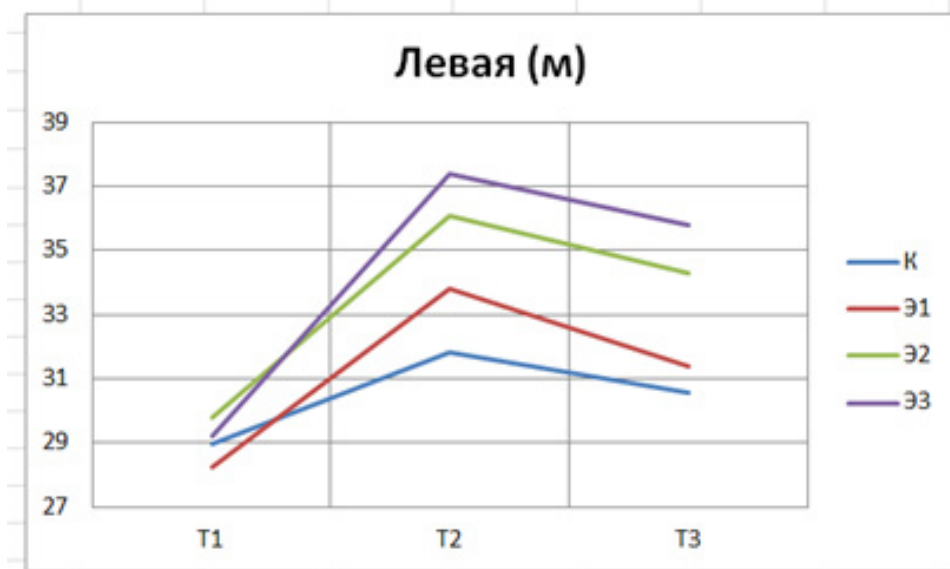


Fig.3

Table 3

	T1	T2	T3
К	28,9	31,8	30,5
31	28,2	33,8	31,3
32	29,8	36,1	34,3
33	29,2	37,4	35,8

In Fig. 3 and Table 3, according to the results of the exercise on the left hand, it can be seen that the highest increase in static strength was in the experimental group 3. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In experimental groups 1 and 2 the indicators are also higher than in the control group.

There was an increase in the control group but due to the development of strength in dynamic exercises.

The results of the study on an experimental isometric exercise, the indicator of the maximum effort retention time in seconds, right hand, men's groups: T1 test - September, T2 test - December, T3 test - February.

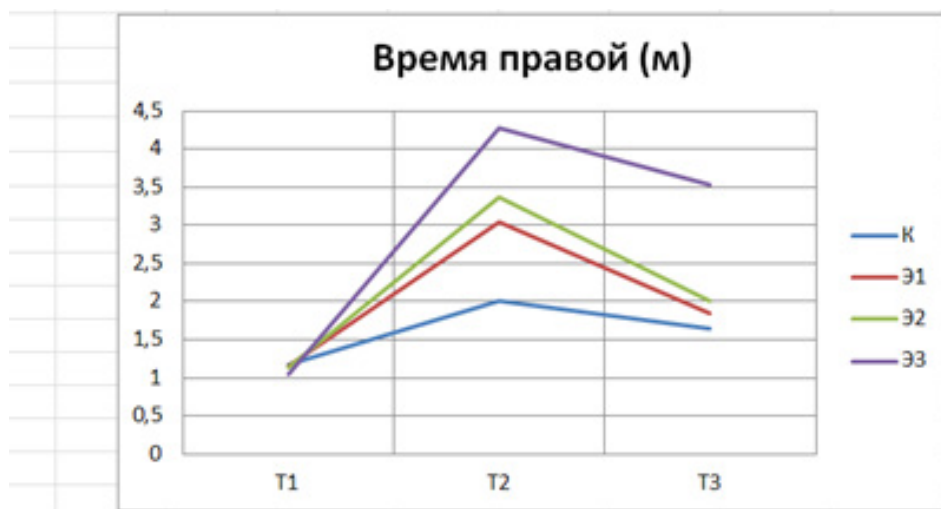


Fig.4

Table 4

	T1	T2	T3
K	1,17	2,01	1,64
Э1	1,16	3,05	1,85
Э2	1,13	3,36	2,01
Э3	1,05	4,28	3,53

In Fig. 4 and Table 4, according to the results of the exercise on the right hand, it can be seen that the highest increase in the retention time of the maximum static force was in the experimental group 3. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In the experimental groups 1 and 2, the indicators are also higher than in the control group.

There was an increase in the control group, but due to the development of strength in dynamic exercises, but it is insignificant.

The results of the study on an experimental isometric exercise, the indicator of the maximum effort retention time in seconds, left hand, men's groups: T1 test - September, T2 test - December, T3 test - February.

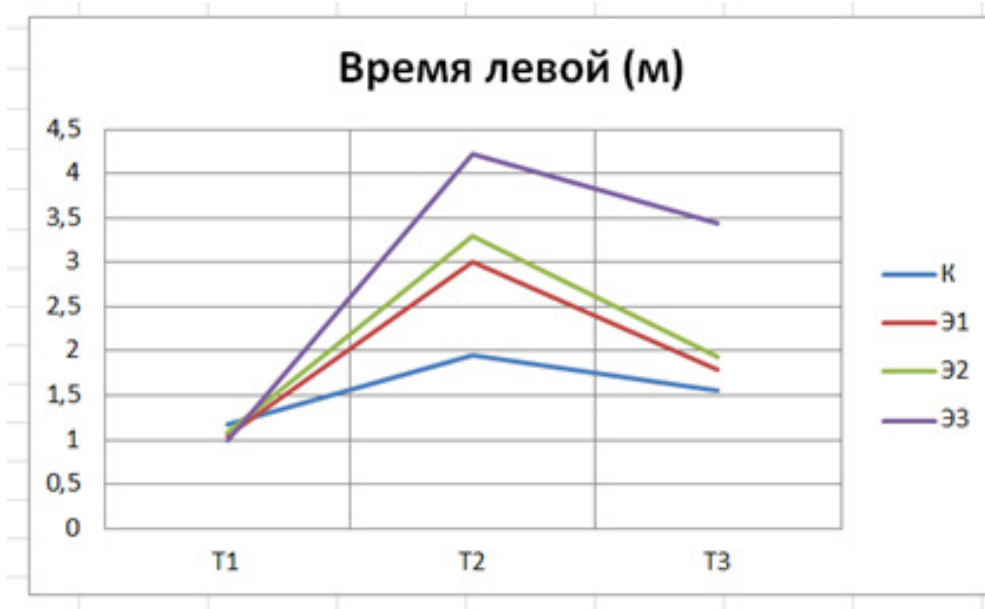


Fig.5

Table 5

	T1	T2	T3
K	1,18	1,95	1,56
Э1	1,05	3,01	1,81
Э2	1,08	3,31	1,94
Э3	0,99	4,22	3,45

In Fig. 5 and Table 5, according to the results of the exercise on the left hand, it can be seen that the highest increase in the retention time of the maximum static force was in the experimental group 3. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In the experimental groups 1 and 2, the indicators are also higher than in the control group.

There was an increase in the control group. But due to the development of strength in dynamic

exercises, it is insignificant.

The results of the study on pulling up from the hanging lying on a low crossbar of women's groups: T1 test - September, T2 test - December, T3 test - February.

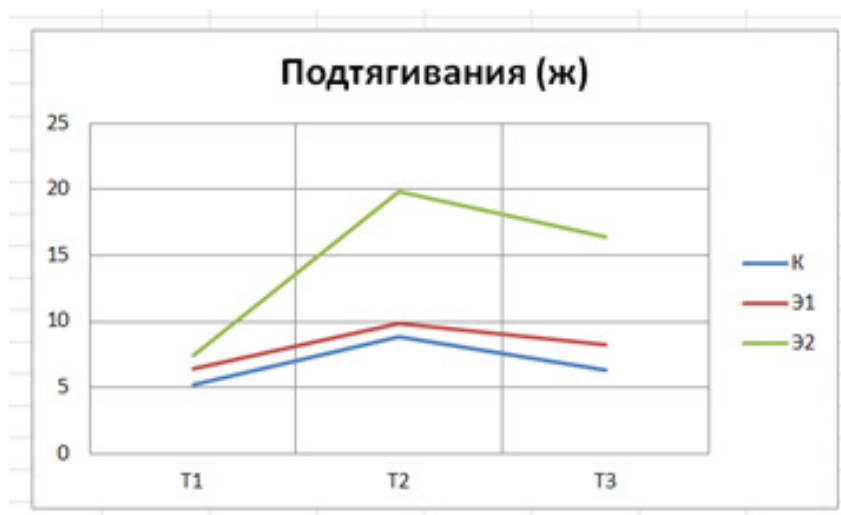


Fig.6

Table 6

	T1	T2	T3
К	5,2	8,8	6,3
31	6,4	9,9	8,2
32	7,4	19,8	16,4

Fig. 6 and Table 6 show that the highest increase in pulling up from hanging lying on a low crossbar was in the experimental group 2. The effect of using an electronic measuring device is visible.

In experimental groups 1, this did not happen and the result of the increase is approximately the same as in the control group.

The results of the study on an experimental isometric exercise, strength index in kilograms, right arm, women's groups: T1 test - September, T2 test - December, T3 test - February

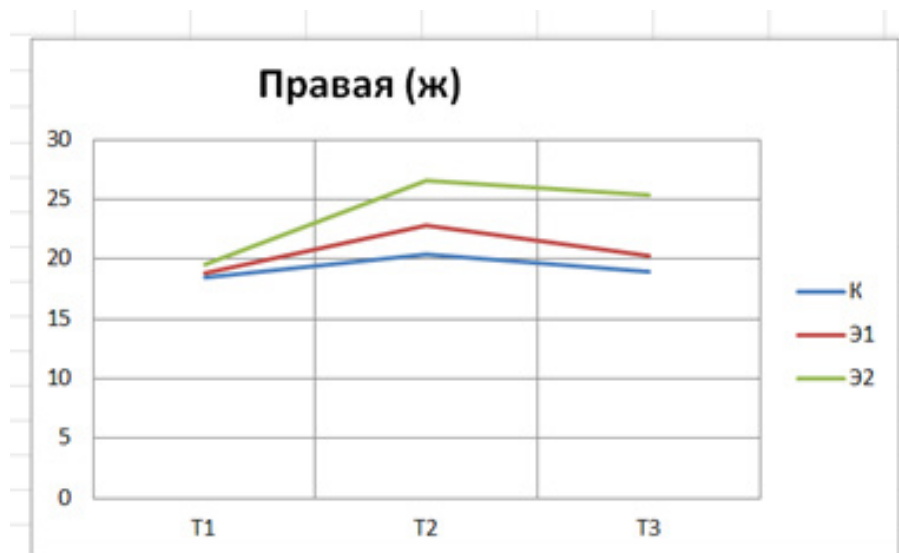


Fig.7

Table 7

	T1	T2	T3
К	18,5	20,4	18,9
31	18,9	22,7	20,3
32	19,6	26,6	25,4

In Fig. 7 and Table 7, according to the results of the exercise on the right hand, it can be seen that the highest increase in static strength was in the experimental group 2. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In the experimental group 1, the indicators

are also higher than in the control group.

There was an increase in the control group but due to the development of strength in dynamic exercises.

The results of the study on an experimental isometric exercise, strength index in kilograms, left arm, women's groups: T1 test - September, T2 test - December, T3 test - February.

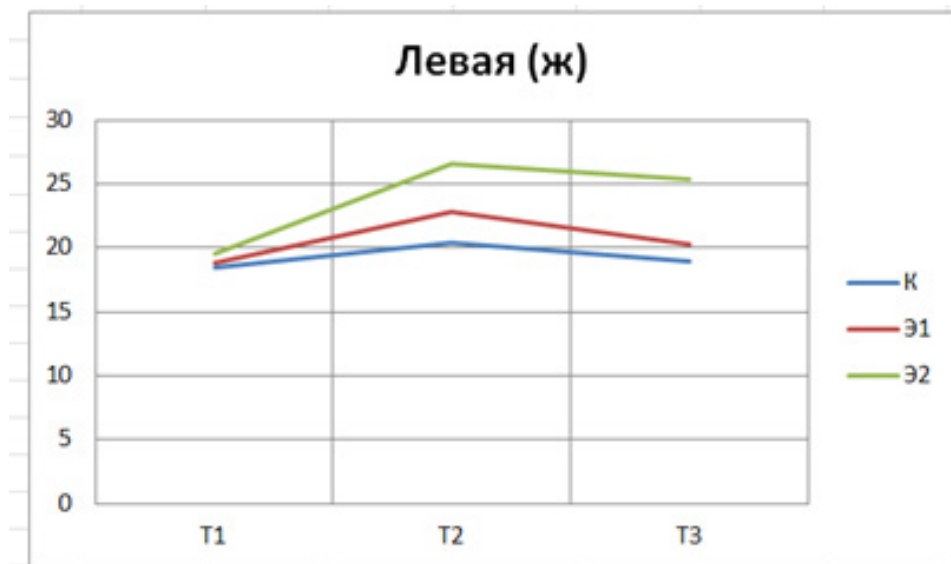


Fig.8

Table 8

	T1	T2	T3
К	18,0	20,2	18,6
Э1	17,8	21,8	19,7
Э2	18,3	27,0	25,8

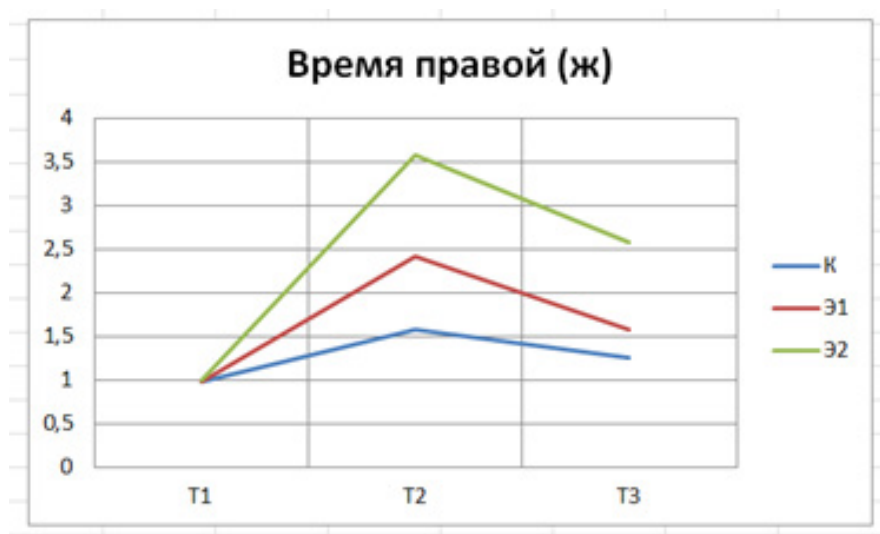


Fig.9

Table 9

	T1	T2	T3
K	0,98	1,58	1,25
Э1	0,98	2,42	1,58
Э2	1,02	3,58	2,58

In Fig. 8 and Table 8, according to the results of the exercise on the left hand, it can be seen that the highest increase in static strength was in the experimental group 2. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In the experimental group 1 the indicators are also higher than in the control group.

There was an increase in the control group but due to the development of strength in the dynamic exercises.

The results of the study on the experimental isometric exercise, the indicator of the maximum effort retention time in seconds right hand, women's groups: T1 test - September, T2 test - December, T3 test - February.

In Fig. 9 and Table 9, according to the

results of the exercise on the right hand it can be seen that the highest increase in the retention time of the maximum static force was in the experimental group 2. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In experimental group 1 the indicators are also higher than in the control group.

There was an increase in the control group but due to the development of strength in dynamic exercises. But it is insignificant.

The results of the study on an experimental isometric exercise, the indicator of the maximum effort retention time in seconds, left hand, women's groups: T1 test - September, T2 test - December, T3 test - February.

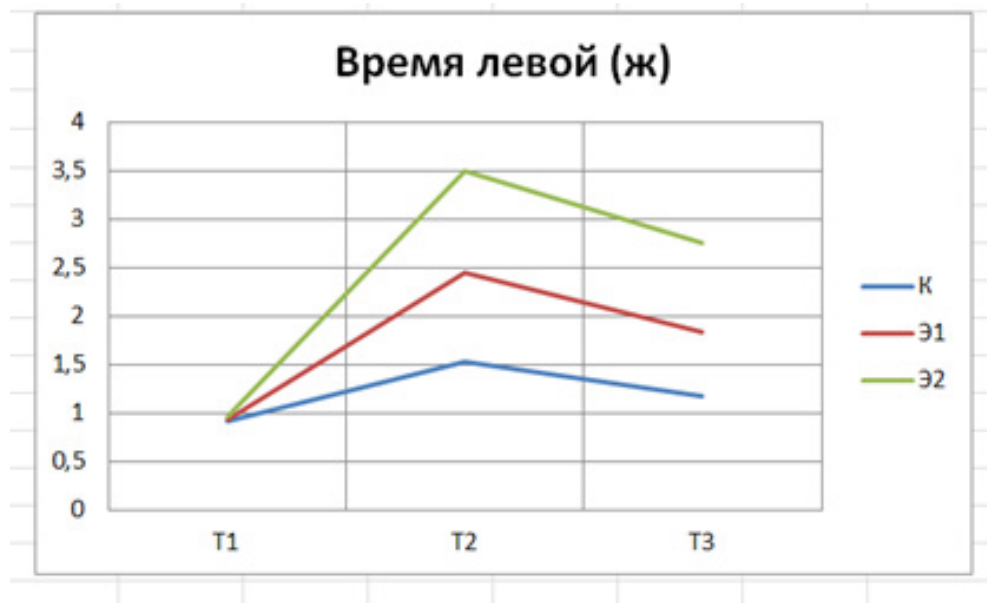


Fig. 10

Table 10

	T1	T2	T3
K	0,92	1,53	1,18
Э1	0,93	2,44	1,84
Э2	0,96	3,52	2,76

In Fig. 10 and Table 10, according to the results of the exercise on the left hand it can be seen that the highest increase in the retention time of the maximum static effort was in the experimental group 2. A more stable preservation of the training effect was achieved. The effect of using an electronic measuring device is visible.

In the experimental group 1 the indicators are also higher than in the control group.

There was an increase in the control group but due to the development of strength in dynamic exercises. It is insignificant.

Conclusion

The training process of armwrestlers-students using an electronic measuring device in static training with insurmountable resistance (isometry) is clearly effective.

The trainings were held on a high emotional background. A competitive effect appeared in the training. The general pedagogical principles of activity, visibility, consciousness are being implemented.

It became possible to take control measurements in static force with insurmountable resistance (isometry) in armwrestlers- students at specific points along the trajectory of movement, in one technique or another to further control the increase in strength results in training cycles.

It became possible to set an individual load within one workout.

The experiment confirmed the hypothesis about the need to create a larger number of static control points for the amplitude of movements.

References

1. Belsky I.V. *Sistemy effektivnoj trenirovki: Armrestling. Bodibilding. Benchpress. Pauerlifting* [Effective training systems: Arm wrestling. Bodybuilding. Benchpress. Powerlifting]. Minsk: Vida - N LLC. 2002: 352 [In Russ.].
2. Bill Starr. Power frame (part 2) *Ironman*. 2006; 52: 40-45 [In Russ.].
3. Bill Starr. Power frame (Part 4). *Ironman*. 2006; 54: 40-45 [In Russ.].
4. Zhivora P.V., Rakhmatov A.I. *Armsport: tehnika, taktika, metodika obucheniya: uchebnoe posobie dlya studentov vysshih pedagogicheskikh uchebnyh zavedenij* [Armsport: technique, tactics, teaching methods: Textbook manual for students. higher. pedagogical studies institutions]. M.: Publishing center "Academy". 2001: 112 [In Russ.].
5. Matveev L.P. *Teoriya I metodika fizicheskoy kul'tury. Uchebnik dlya institutov fizicheskoy kul'tury* [Theory and methodology of physical culture. Textbook for physical education institutes]. M.: Physical culture and sport. 1991: 543 [In Russ.].
6. Meidinovich O.R. *Metodika fizicheskoy podgotovki kvalificirovannyh armrestlerov. Vypusknaya kvalifikacionnaya rabona* [Methods of physical training of qualified wrestlers. Final qualifying work]. NRU BelSU. 2017: 41 [In Russ.].
7. Kotsa Ya.M. *Sportivnaya fiziologiya: Uchebnik dlya institutov fizicheskoy kul'tury* [Sports physiology: Study. for institutions of physical cultures]. M.: Physical culture and sport. 1986: 240 [In Russ.].
8. Kuramshin Yu.F. *Teoriya I metodika fizicheskoy kul'tury: uchebnik* [Theory and methodology of physical culture: Textbook]. M.: Soviet Sport. 2004: 464 [In Russ.].
9. Dvornik L.S. *Tyazhelaya atletika* [Weightlifting]. M.: Ed. Yurayt. 2019; 2: 469 [In Russ.].
10. Usanov E.I., Burmistrov V.N. *Armrestling – bor'ba na rukah: uchebnoe posobie* [Arm wrestling – hand wrestling: studies manual]. M.: Publishing House of RUDN. 2002: 289 [In Russ.].
11. Kholodov Zh.K., Kuznetsov V.S. *Teoriya I metodologiya fizicheskogo vospitaniya I sporta: Uchebnoe posobie dlya studentov vysshih uchebnyh zavedenij* [Theory and methodology of physical education and sports: Textbook manual for students of higher studies institutions]. M.: Publishing center "Academy". 2001: 480 [In Russ.].

Submitted: 24.02.2022

Author's information:

Sergey V. Turlakov - Honored Coach of the Udmurt Republic in arm wrestling, M.T. Kalashnikov State Technical University, Izhevsk, 426069, Russia, Izhevsk, Studentskaya str., House 7, e-mail: g1badullinildus@yandex.ru

Tatyana G. Turlakova - Senior lecturer, M.T. Kalashnikov State Technical University, Izhevsk, 426069, Russia, Izhevsk, Studentskaya str., House 7, e-mail: g1badullinildus@yandex.ru

Marat Z. Akhmetzyanov - Senior Lecturer, M.T. Kalashnikov State Technical University, Izhevsk, 426069, Russia, Izhevsk, Studentskaya str., House 7, e-mail: g1badullinildus@yandex.ru
